WOAH Collaborative Centre Reports Activities 2022

Activities in 2022

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Centre Information

Title of WOAH Collaborating Centre	FGBU "VGNKI" (Status 1: Food safety; Status 2: Diagnostics and Control)
Address of WOAH Collaborating Centre	5 Zvenigorodskoye Highway 123022 Moscow, Russia
Tel.:	+74992531491
E-mail address:	kanc@vgnki.ru
Website:	www.vgnki.ru
Name Director of Institute (Responsible Official):	Leonid Kish
Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Maria Gergel
Name of the writer:	Olga Ivanova

TOR1 AND 2: SERVICES PROVIDED

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by WOAH

Disease control	
Title of activity	Scope
	A total of 5564 samples were tested within the framework of implementation of the plan for state epizootological monitoring

State epizootiological monitoring	of the territories of the Russian Federation in accordance with the order of the RF № 1576 dated from December 27, 2021 "On laboratory research as part of the implementation of the Rosselkhoznadzor measures in 2022 " Testing and (or) examination of goods subjected to the state veterinary control (supervision)". To monitor for brucellosis disease, 4822 serum samples from cattle and sheep were tested. A significant part of the blood serum samples from animals (98.99%) was negative, 49 samples reacted positively. To monitor for leptospirosis disease, a total of 486 cattle sera were analyzed for the presence of antibodies to 7 Leptospira serogroups (40.74% of positive tests). In total, 256 samples of pathological material were subjected to bacteriological studies for the detection of Salmonella spp. 2 samples contained the causative agent of salmonellosis, which represented 0.78% of the examined samples.
Diagnosis, biotechnology and laboratory	
Title of activity	**Scope**
Diagnosis and surveillance of infectious diseases of animals and birds	As part of the plan for state epizootological monitoring of the territories of the Russian Federation and the identification of risks associated with the emergence and spread of infectious animal diseases, a total of 3671 PCR tests were carried out to identify pathogens of various infectious agents, including: - Schmallenberg disease - 1716 serum samples from 8 administrative regions of the Russian Federation; - Infectious bovine rhinotracheitis - 394 different biological samples from 10 administrative regions of the Russian Federation, 9.4% were positive. - Bovine leukemia– 714 PCR tests of whole blood samples from 5 administrative regions of the Russian Federation, 11.3% were positive. - Aleutian mink disease - 470 tests of different biological samples from 7 administrative regions of the Russian Federation; - Porcine proliferative enteropathy (caused by Lawsonia intracellularis) - 232 tests of different biological samples from 4 administrative regions of the Russian Federation, 5.17% were positive; - Porcine reproductive and respiratory syndrome - 145 PCR tests of the samples from 4 administrative regions of the Russian Federation. Also, in 2022, 589 washout samples from the surfaces of equipment and food products and 274 biological samples from various animals (dogs, cats, roe deer, elks) were tested for SARS-COV-2 RNA. 1720 samples of swine products were tested for the presence of DNA material of African swine fever virus. In addition, 2980 different PCR tests were carried out on domestic animals and different bird species. Specificity, sensitivity and stability tests of 15 different PCR kits for veterinary diagnostic were carried out. As part of the work on the control of vaccines by PCR, 208 vaccines from 21 manufacturers were examined for contamination with 14 different foreign viruses and mycoplasmas. Additionally, 12 samples of fetal bovine serum, trypsin and samples of animal cell cultures used for culture studies were studied. While conducting this scientific study,

	materials with no species identification from 96 elk (Alces alces), 12 roe deer (Capreolus capreolus) and 10 deer, all of which were shot during the hunting season, was examined for the presence of the genome of 12 viruses: bovine diarrhea virus (BVDV), respiratory-bovine syncytial infection (BRSV), bovine herpesviruses (BHV) 1, 2, 4, 5 and 6, bovine coronavirus (BCov), rotaviruses, Mastadenovirus, cervid herpesvirus 2 (CvHV-2) and elk herpesvirus 1 (ElkHV-1).
Diagnosis, biotechnology and laboratory	
Title of activity	Scope
Research	Identification and typing of isolates of Pasteurella multocida using molecular methods; - Screening studies of viral diseases in wild animals (deer, roe deer, elk); - Validation of vaccine quality control methods; - Method for detection of genetically modified Atlantic salmon AquAdvantage Salmon by PCR with real-time detection; - Method for detection of resistance genes to sulfonamides sul1 and trimethoprim dfrA12 in bacteria of the Enterobacteriaceae family by PCR with real-time detection; - Technique for detecting the aadA1 / aadA2 genes that provide resistance to aminoglycosides in bacteria of the Enterobacteriaceae family by PCR with real-time detection.
Food safety	
Title of activity	Scope
State monitoring of food and feed safety	As part of the state quality and safety monitoring program, the FGBU «VGNKI» carried out an annual research on determining chemical contaminants (antibacterial agents, hormonal growth promoters and other animal drugs, heavy metals, persistent organic pollutants, pesticides, mycotoxins, etc.), adulteration of dairy products (with non-vegetable fats, meat/fish products with meat of undeclared animal species) and microbiological contaminants. Studies were conducted in food products of animal origin (meat, offal, milk, fish, honey, meat, and dairy products), feedingstuffs, feed supplements and animal biomaterial. In 2022, FGBU «VGNKI» performed 21868 tests in 7036 samples, which is approximately 3 tests per sample. 4900 samples were of domestic origin (70%). Samples of foreign origin were from Republic of Belarus, Argentine Republic, Federative Republic of Brazil, Republic of Paraguay, China, Iran and other countries. 445 out of 7036 samples (6.3%) were non-complaint with EAEU safety and quality regulations due to chemical and microbiological contamination above the maximum levels and adulteration. Milk, beef, pork and offal were among those products with the least percentage of positive results (0.65%, 0.33%, 0.15%). None of non-complaint samples were found for sheep, horse rabbit meat and offal, which can be partly explained by the fewer number of conducted tests. Among the xenobiotics, the most frequently detected were dioxins (12.3%), coccidiostats (10.1%), oxymethylfurfurol – the contaminant of honey (7.8%) and

	avermectins (6.6%), all above the maximum levels. No hormonal growth stimulators, beta-agonists and sedative drugs were found neither in domestic origin samples, nor in foreign. After conducting DNA analyses on samples of foreign origin, horse DNA appeared to be the most frequently detected (33% of positive tests). There were also findings of poultry, swine and ruminant animals' DNA, but no DNA of soy, other plants or carnivorous animals. Adulteration with non-milk fat was found in 7.5% of milk product samples.

Feed safety	
Title of activity	Scope
State monitoring of food and feed safety	Feed materials, reindeer offal and wild-caught fish showed the highest occurrence of positive results (9.6%, 7.0%, and 4.5%, respectively), followed by poultry and honey. Most trials showed the presence of heavy metals in wild-caught fish. Using risk based sampling technique, it was determined that reindeer liver and kidneys were contaminated with cadmium, mercury and dioxins. Such results for honey and poultry may be explained by the zero tolerance policy for almost all veterinary drug residues in these two types of products in the EAEU legislation.In 2022 FGBU «VGNKI» performed the analysis of 1382 samples of feed materials: compound feed, feed additives, forage grain, soy and sunflower cake, etc. 127 samples were positive (9.2%). GMOs were detected in 12.9% of samples. Heavy metals above the maximum levels – in 1.1% of samples, and mycotoxins – in 2.3%.

Other	
Title of activity	Scope
	FGBU "VGNKI" is implementing a research project called "Veterinary monitoring of bacterial resistance to antimicrobial agents and identification of genetic determinants of resistance from environmental objects" (hereinafter referred to as R&D). As part of the R&D, 2942 bacterial isolates were isolated in the period from 2021 to 2022, including: Enterococcus spp. - 1222, Escherichia coli - 898, S. aureus - 302, Campylobacter spp. - 14, Listeria monocytogenes - 374, Salmonella spp. - 132. Proportion of multi-resistant isolates, according to EUCAST interpretation (simultaneous resistance to three or more classes): - Escherichia coli - 49.6%, - Salmonella spp. - 32.2%, - Enterococcus spp. - 2.9%, - S. aureus - 74%. All results of veterinary monitoring for antibiotic resistance are available on the online platform for analysis, visualization and sharing of data on antibiotic resistance - AMRcloud. The data is available via the links: ECOFF: https://public.amrcloud.net/link?id=lqGxM47G024G014 EUCAST 2022: https://public.amrcloud.net/link?id=VtIqs08ST27ST14 CLSI 2022: https://public.amrcloud.net/link?id=cJHvE21vr28vr14 In addition to a phenotypic assessment of resistance, molecular genetic methods were also implemented, in particular, whole

Antimicrobial resistance	genome sequencing of multiresistant isolates of Salmonella enterica, Escherichia coli, Campylobacter spp., Listeria monocytogenes, Staphylococcus spp., Enterococcus spp. as well as bioinformatics analysis of the obtained data. Analysis of the whole genome sequencing data allows for accurate taxonomic and/or strain identification of microorganisms with determination of sequence types, functional gene annotation, phylogenetic analysis of genomes in various ways, search for virulence factors, etc. Genetic characterization is aimed at assessing the prevalence of genetic determinants of resistance among zoonotic bacteria isolated from productive animals and from food and feed products. Antibiotic resistance genes are usually associated with the mobile part of the bacterial genome: with plasmids, transposons, integrons, genomic islands, etc. All of these components provide the means for a horizontal gene transfer between taxonomically and ecologically distant microorganisms like, for example, between the microbiomes of agricultural animals and birds and the human microbiome. Whole genome sequencing data not only reveals the presence of resistance genes, but also establishes their localization, including on mobile elements. The combination of classical microbiological methods with molecular genetic methods allows to obtain the most complete information about the various properties of bacteria, and also helps to confirm a number of phenotypic properties of specific isolates. In 2022, Methodology was developed for the detection of resistance genes to aminoglycosides, sulfonamides, trimethoprim in bacteria of the Enterobacteriaceae family. According to it, samples can be taken from food raw materials, food products, from animals, from environmental objects with or without the stage of bacterial isolation from these samples. Fragments of aadA1 and aadA2 genes were chosen that encode an enzyme that inactivates aminoglycosides by adding an adenine nucleotide. Fragments of sul1 and dfrA12 genes were selected that encode atypical enzymes of folate biosynthesis in bacteria, which practically do not interact with sulfonamides and trimethoprim. All target genes were localized on mobile elements: plasmids. A fragment of the csrB chromosomal gene was selected as an internal control element, designed to detect E. coli DNA (studies from 2020). ↗ design of primer and probe sets for amplification of aadA1 and aadA2 gene fragments (one set); sul1, dfrA12; ↗ optimization of PCR conditions; ↗ development of positive control samples based on plasmid DNA solutions; ↗ validation tests of the accepted methodology; ↗ determination of analytical characteristics. Within the framework of R&D, the most scientifically interesting strains of microorganisms are regularly deposited, and are later used as controls in conducting studies to test the sensitivity of microorganisms to antibiotics, as well as in the diagnosis of infectious diseases (salmonellosis, campylobacteriosis, etc.) For the implementation of the national patent deposit procedure, multidrug-resistant strains of microorganisms with phenotypic resistance were selected, and which were confirmed by the

	corresponding genetic determinants of resistance during a whole genome sequencing. The State Collection contains 18 newly isolated and fully characterized strains of microorganisms with multidrug resistance, three of which received patentable documents for a period of 20 years. Two applications have been submitted to FIIP (Federal Institute of Industrial Property) for obtaining patents.

TOR3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main fucus area for which you were designated

Proposal title	Scope/Content	Applicable area
Studies quality control	Patent RU 2 782 213 C1 «Salmonella infantis bacterial strain used as a positive control for molecular genetic and microbiological studies related to determining the sensitivity of microorganisms to antibacterial drugs». Kish L., Ivanova O., Soltynskaya I., Lenev S., Prasolova O., Bogomazova A.	Laboratory expertise
Studies of quality control	Patent RU 2 769 226 C1 «Set of oligonucleotides for semi-quantitative assessment of chicken DNA content in meat products by real-time PCR ». Gergel M., Bogomazova A., Soltynskaya I., Krylova E., Zaytseva E., Putintseva A.	Laboratory expertise

4. Did your Collaborating Centre maintain a network with other WOAH Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Federal State Budgetary Institution "Federal Center for Animal Health" (FGBU "ARRIAH")	Vladimir, Russia	Europe	Control and standardization of veterinary biopreparations

TOR4 AND 5: NETWORKING AND COLLABORATION

5. Did your Collaborating Centre maintain a network with other WOAH Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
The French Agency for Veterinary Medicinal Products (ANSES-ANMV)	Javene, France	Europe	Risk assessment and management with regard to veterinary medicinal products

TOR6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOAH?

Yes

NAME OF EXPERT	KIND OF CONSULTANCY	SUBJECT
Olga Ivanova	Round table of experts as part of the World Antimicrobial Awareness Week (Together with FAO, WHO, WOAH, UNEP)	Antimicrobial resistance

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

No

No

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOAH, to personnel from WOAH Members?

Yes

a) Technical visit : 0

b) Seminars : 0

c) Hands-on training courses: 2

d) Internships (>1 month) : 0

TYPE OF TECHNICAL TRAINING PROVIDED (A, B, C OR D)	CONTENT	COUNTRY OF ORIGIN OF THE EXPERT(S) PROVIDED WITH TRAINING	NO. PARTICIPANTS FROM THE CORRESPONDING COUNTRY
c	Advanced training course on molecular biological methods of control of immunobiological agents for veterinary use	Belarus	5
	Topic of general microbiology and	Turkey	1

c	the basics of molecular biology		

TOR8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOAH?

Yes

NATIONAL/INTERNATIONAL	TITLE OF EVENT	CO-ORGANISER	DATE (MM/YY)	LOCATION	NO. PARTICIPANTS
International	Socially Significant Infections of Farm Animals: Prevention and Cont ol Measures	FAO, WHO, WOAH, UNEP	2022-12-15	VGNKI, Moscow	150

TOR9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOAH that may be useful to Members of WOAH

a) Articles published in peer-reviewed journals:

67

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2. Yatsentyuk, S. Mycoplasma contamination of bull semen used for artificial insemination. Siberian Journal of Life Sciences and Agriculture, Vol. 14 (4), 2022.

3. Krasnikova, M., Lazareva, E., Yatsentyuk, S. The effect of disinfectants on the SARS-CoV-2 RNA detection in swabs from various surfaces. Applied Biochemistry and Microbiology, Vol. 58 (8), 2022, pp. 932–937.

4. Yatsentyuk, S., Pchelnikov, A., Safina, E., Krasnikova, M. The first study on the occurrence of bovine herpesviruses in the wild fauna of the Moscow region, Russia. Veterinary World. Vol. 15 (8), 2022, pp. 2052-2058.

5. Brusova, M., Gorbacheva, N., Krasnikova., M., Yatsentyuk, S. Studies of vaccines for birds for the presence of foreign agents by PCR method. Veterinary, Animal Science and Biotechnology, (3), 2022, pp. 57-64.

6. Kozlova, A., Yatsentyuk, S., Sokolov, V., Manoyan, M. Studying the resistance of pathogenic and opportunistic fungi to antifungal drugs. Veterinary Science Today, Vol. 11 (1), 2022, pp. 20-26.

7. Pchelnikov, A., Yatsentyuk, S. Infectious cattle rhinotracheitis in imported wild ruminants. Veterinary medicine (3), 2022, pp. 25-27.

8. Pchelnikov, A., Yatsentyuk, S. Herpes virus type 6 in cattle. Veterinary medicine (6), 2022, pp. 20-24.

9. Yatsentyuk, S., Krasnikova, M., Pchelnikov, A. Studying the prevalence of adenoviruses in the populations of wild artiodactyls of the Moscow region. Veterinary, Animal Science and Biotechnology. (10), 2022, pp. 68-75.

10. Pirozhkov, M., Galiakbarova, A., Pimenov, N. The current state of the domestic market for vaccines against colibacillosis of animals. Veterinary medicine, animal science and biotechnology, (2), 2022, pp. 12-20.

11. Kuzmenko, M., Tsaturyan, L., Sklyarov, O. Improving the control of activity of vaccines against erysipelas. In the collection: Innovative technologies in animal science and veterinary medicine. Collection of articles of the IV All-Russian Scientific and Practical Conference, 2022, pp. 33-36, Penza.

12. Kuzmenko, M., Tsaturyan, L., Sklyarov, O., Pivovarova, O. Characterization of some production and control strains of Erysipelothrix rhusiopathiae, Veterinaria, (4), 2022, pp. 35-42.

13. Tsaturyan, L., Sklyarov, O., Fedyushin, D., Kavanosyan, V., Kuzmenko, M., Abrahamyan, V. Immunobiological properties of Bacillus anthracis vaccine strains. Veterinary medicine, (5), 2022, pp. 32-38.

14. Kuzmenko, M., Tsaturyan, L., Sklyarov, O., Chernykh, O., Krivonos, R., Basankin, A. Improvement of methods of quality control of vaccines against porcine erysipelas. Veterinary medicine of Kuban, (2), 2022, pp. 18-20.

15. Kuzmenko, M., Tsaturyan, L., Sklyarov, O. Analysis of epizootological data for swine erysipelas on the territory of the Russian

Federation. Problems of agro-industrial complex development in the region. Vol. 2 (50), 2022, pp. 158-161.
16. Lakhov, S., Petrova, T., Bachinskaya, V., Antipov, A., Lugovaya, I., Burlakova, G. Sanitary and hygienic study of feed and evaluation of the sorption properties of the feed additive MAXISORB®, Veterinary Medicine (9), 2022, pp. 70-72.
17. Lugovaya, I., Petrova, Yu., Azarnova, T., Naydensky, M., Antipov, A., Kirzhinov, R., Anshakov, D., Zolotukhina, E., Burlakova, G. Results of veterinary and sanitary examination of turkeys using biostimulants in early ontogenesis. FSBEI HE "Moscow State Academy of Veterinary Medicine and Biotechnology named after K.I. Scriabin, FGBU "VGNKI", 2022, (1), pp. 89-92.
18. Makarov, D., Kozeicheva, E., Lavrukhina, O., Gergel, M., Kish, L. Different countries' requirements for the content of chemical contaminants in food products: what to consider when exporting. Production Quality Control, (3), 2022, pp. 50-57.
19. Kozeicheva, E., Makarov, D., Kozhushkevich, A., Lebedev, A. The problem of food contamination by 3-MCPD and glycidyl esters of fatty acids. Production Quality Contro,l (6), 2022, pp. 36-42.
20. Makarov, D., Ivanova, O., Pomazkova, A., Egoreva, M., Prasolova, O., Lenev, S., Gergel, M., Bukova, N., Karabanov, S. (2022). Antimicrobial resistance of commensal Enterococcus faecalis and Enterococcus faecium from food-producing animals in Russia. Veterinary World, Vol. 15 (3), 2022, pp. 611-621. DOI: 10.14202/vetworld.2022.611-621.
21. Makarov, D., Nesterenko, I., Belov, S., Tretyakov, A., Nebera, E. Animal fat in dairy products: the adulteration problem and control methods. Production Quality Control, (12), 2022, pp. 42-47.
22. Makarov, D., Gergel, M. Three Challenging Problems Of Honey Official Control: Antimicrobial Residues in Honey (Part 1). Veterinary medecine (9), 2022, pp. 12-16. DOI: 10.30896/0042-4846.2022.25.9.12-16.
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41. Sorokin, A., Bakay, K., Nesterenko, I. Quantitative determination of the content of glyphosate and its metabolite in soybeans and meal by HPLC-MS/MS. IV Congress of Analysts of Russia, Moscow, September 26-30. Abstracts of reports, p. 518.
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b) International conferences:
11
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2. Gorbacheva, N., Yatsentyuk, S., Krasnikova, M., Kozlova, A., Brusova, M. Screening of live vaccines against avian virus diseases for contamination with avian gyrovirus 2 by PCR method. Materials from the International scientific-practical conference of young scientists. Losino-Petrovsky, 2022, pp. 78-83.
3. Pchelnikov, A., Yatsentyuk, S., Krasnikova, M., Safina, E. Study of the prevalence of bovine herpes virus type 1 in wild artiodactyls of the Moscow region. In the collection: Actual problems of treatment and prevention of diseases of young animals. Materials from the International scientific-practical conference. Editorial Board: N.I. Gavrichenko (editor-in-chief) et al., 2022. pp. 183-186, Vitebsk.
4. From November 24th – 25th of 2022, specialists of the Rosselkhoznadzor and FGBU "VGNKI" took part in the Third Ministerial Conference on Antimicrobial Resistance in Muscat (Oman), at the end of which the Muscat Ministerial Manifesto on AMR was adopted.
5. On November 29, 2022 a round table of conference was held as part of the World Antimicrobial Awareness Week (Together with experts from FAO, WHO, WOAH, UNEP), Moscow 2022.
6. On December 8, 2022 specialists of the FGBU "VGNKI" took part in the international conference "Food safety and joint efforts to reduce resistance to antimicrobial drugs", held under the auspices of the Federal Service for Surveillance on Consumer Rights protection and Human Wellbeing (Rospotrebnadzor) with the technical assistance from the Food and Agriculture Organization of the United Nations.
7. Putintseva A., Kirsanova N., Leukhina O., Krylova E. Selection of sequences for internal control for use in PCR methods for determining the species affiliation of food products components. Science of young people is the future of Russia: Materials of the 7th International scientific conference of promising developments of young scientists. 12-13.12.2022. Kursk, Russia. V.4. P.328-331. DOI: 10.47581/2022/ML-71/Putinceva.01.
8. Prasolova O., Soltynskaya I., Bogomazova A., Krylova E., Ivanova O. Review of problems in registration of vaccines for animals containing genetically modified strains of microorganisms. Scientific basis for the production and quality assurance of biological drugs. Materials of the International Scientific and Practical Conference of Young Scientists. 27.10.2022, Moscow, Russia. 2022. – P. 305-309. Edited by Corresponding Member of the RAS Zaberezhny A. DOI 10/47804/9785899040313_2022_300.
9. Bogomazova A., Krylova E., Gordeeva V., Timofeeva I., Putintseva A., Kirsanova N., Prasolova O., Ivanova O., Soltynskaya I. Use of metagenomic samples collected at agricultural enterprises for PCR studies as part of veterinary monitoring of bacterial antibiotic

resistance. Materials of the international scientific-practical conference «Fundamental and applied aspects of microbiology in science and education». 25-26.05.2022, Ryazan, Russia. P.66-69. Edited by Evdokimova O., Novak A., Kotelevets E.
10. Kirsanova N., Putintseva A., Timofeeva I., Osipova Yu., Krylova E., Prasolova O., Bogomazova A., Soltynskaya I., Ivanova O. Development and validation of a PCR method for detecting the qnrS and qnrB resistance genes that provide resistance to fluoroquinolones in Enterobacteriaceae. Abstracts of the XXIV International IACMAC Congress on antimicrobial theherapy. 25-27.05.2022. Moscow, Russia. CMAC. 2022. V.24. S.1, P.17.
11. Prasolova O., Timofeeva I., Osipova Yu., Akinina T., Krylova E., Kirsanova N., Kurichenkova E., Putintseva A., Bogomazova A., Leukhina O., Soltynskaya I. Analysis of the distribution of genetic determinants of resistance to tetracyclines, cephalosporins, penicillins, fluoroquinolones and colistin within the framework of veterinary monitoring in the Russian Federation. Abstracts of the XXIV international IACMAC congress on antimicrobial theherapy. 25-27.05.2022. Moscow, Russia. CMAC. 2022. V.24. S.1, P.29.

c) National conferences:
3
1. Gorbacheva, N., Brusova, M., Yatsentyuk, S, Krasnikova, M., Kozlova, A. Detection of pestiviral contamination of biological preparations by the method of real-time RT-PCR. Conference "Innovative solutions to topical biosafety issues". Kazan, 2022.
2. Yatsentyuk, S, Pchelnikov, A., Krasnikova, M., Borunova, S., Gnezdilova, L. Alphaherpesviruses BHV-1 and BHV-5 in cryopreserved semen of bulls. Conference "Innovative solutions to topical biosafety issues". Kazan, 2022.
3. Pchelnikov, A., Yatsentyuk, S. Prevalence of bovine gama-herpes viruses in livestock farms. In the collection: Actual problems of veterinary medicine, zootechnics, biotechnology and examination of raw materials and products of animal origin. Collection of works of the scientific-practical conference. Under the general editorship of S.V. Pozyabina, L.A. Gnezdilova. 2022, pp. 189-190, Moscow.

d) Other (Provide website address or link to appropriate information):
10
10 training programs:
3 training programs named "PCR diagnostics of infectious animal diseases" were held, 28 veterinary specialists were trained.
A course "Molecular biological methods of control of immunobiological agents for veterinary use" was conducted. 5 specialists were trained.
Training was conducted on the topic: "Antibiotic resistance. Measures to contain it" with the use of online learning platforms.
5 advanced training courses were held on the topic of detection, identification and quantifying of GMOs in plant-based products, feed, seeds and planting material.

International cooperation
Throughout the year of 2022, FGBU "VGNKI" had an extensive cooperation with international organizations on a variety of topics and occasions. On January 24, 2022 a delegation from the International Center for the Fight against Antibiotic Resistance (ICARS) visited the Institution. The delegation from the Kingdom of Denmark was headed by the scientific consultant Per Hendriksen.
Later in February, FGBU "VGNKI" conducted a meeting with the Director of the French Agency for Supervision of Medicinal Products for Veterinary Use (ANMV) Jean-Pierre Auran, where the sides discussed plans for the future work on fighting antimicrobial resistance.
In August, specialists of FGBU "VGNKI" held a meeting with the officials of the Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan and specialists of the National Veterinary Reference Center (Kazakhstan). Participants expressed their mutual interest in the exchange of experience and participation in scientific and educational projects of the Institution.
On November 25, 2022 specialists of the Institution participated in the 3rd High-Level World Ministerial Conference on Antimicrobial Resistance (AMR) in Oman. All of the members once again highlighted the importance of making effort when approaching this emerging health problem.

11. What have you done in the past year to advance your area of focus, e.g. updated technology?
- Development of methods for genetic identification of infectious animal disease
- FGBU "VGNKI" obtained a mega grant "Development of means for the prevention of soially significant infections in productive animals basedon modern methods of nutrigenomis"

12. Additional comments regarding your report:
There have been some technical issues